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# Invigoration of Semantic Web Services in Mobile Applications: A Survey

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*Abstract- With the increase in number of mobile devices and its applications provides an environment for the development of semantic web service based applications. The objective of this research article is to review the impact of semantic web services over the mobile applications and suggesting the quality attributes for the improvement of services are analysed.*

*Keywords: Semantic web, Mobile web services, Mobile applications, Semantic methods*

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## I-INTRODUCTION

Mobile computing environment expands its width by integrating the semantic web and web service technologies. The growth of mobile applications needs to provide the interoperability between the applications for the efficient information retrieval. Enterprises find the new way to process and deliver the information in the mobile devices [1]. Mobile phone manufacturers are making mobile phones with multiple operating environment like Windows OS, Android OS, IOS, BlackBerry OS etc., Visual Studio 2013, Java 2 Micro Edition (J2ME) and Android Studio allows the users to develop the mobile applications which are compatible with all the handheld devices [2].

Millions of applications are available for the handheld devices like mobile phones and tablet PCs from their corresponding App stores. These device based applications are offering numerous services to facilitate their consumers in-terms of web services [3]. Web services are internet specific services available on the web. There are so many independent services are given by the various service providers. To improve the Quality of Services (QoS) the web services are needed to be organized, composed and integrated to implement an application or a task.



Fig 1. Architecture for mobile SOA

Representation State Transfer (REST) ful and SOAP (Simple Object Access Protocol) are two different types of categories based on the architecture. The communications between the web services can be done through the messages and is implemented with the SOAP protocol. SOAP specifies the message structure and the implementation of web services over the web [7]. Semantic web technologies gives another dimension to the web and its services. It has crossed its early stages of its journey [4]. Semantic web invigorating the mobile devices by their features such as interoperability, applications and data integration, versatility, reusability and minimising the cost [5][6].

Accessing internet related services through the web pages not possible by the mobile devices due to the limitations of the mobile devices. To access the web services on the mobile devices has to consider the limitations of it like memory, performance, processing capabilities, size etc. To overcome the drawbacks in mobile devices, the user interface (UI) and the business logic should be separated and located in multiple servers. This feature of web services enables and sets the mobile devices and mobile communication into the new era [8] [9]. The service oriented architecture for the mobile devices is shown in the figure 1. This article concentrate on surveying the semantic web services in mobile devices. The contents of the article are organized as follows Section-I gives the introduction, Section-II overviews the existing approaches, Section-III describes the research challenges and Section-IV concludes the survey.

## II-OVERVIEW OF MOBILE WEB SERVICES

The integration of web services from the heterogeneous environment are required to implement the business tasks. It is achieved by the Service Oriented Architecture (SOA) [10]. SOA provides a distributed environment for the information systems. There are two major features offered by SOA: Web services and Mobile computing which forms web services. Web services are the remote methods that are accessed via standard protocols such as SOAP and HTTP [11] [12]. Mobile web services can be handled by an open source API called kSOAP is used for SOAP parsing based on kXML [13].

Nowadays the growth of mobile communication technologies provides great features to the devices in two ways hardware and software. These features includes UMTS and GPRS/ EDGE. The development in the mobile devices enables the communication among the devices through XML web services. The communication between mobile and web services were stored before a decade through Personal Web Server (PWS) [16].

- Mobile web service provisioning will depends upon the following concepts
- Mobile Host [17]
- WS provisioning Framework [15]
- Service Integration Framework [17]
- WS Partitioning Framework [18]

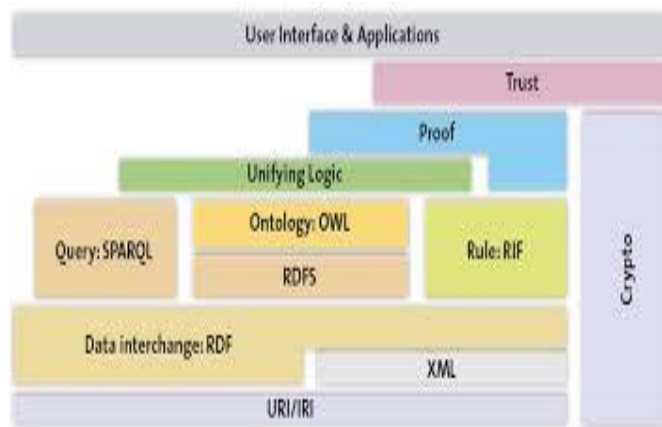


Fig 2 Semantic web layers

Mobile web service selection is important step in the service access process. For that appropriate method has to be used. Consumption of web services for the specific applications / task lies in the mobility aware services (MWS) and is discussed in [19]. The mobile web service selection is based on the capability on the device which considers the resources available in the device and also compares the requirement of the published services [19]. Performance evaluation of the mobile host is very much in need to improve the quality of services in mobile computing. When the mobile host services the concurrent requests from the mobile devices / users it should be managed [15].

*A. Semantic Mobile Web Services*

The layers of the semantic web applications are represented in the following figure 2. The semantic architecture establishes the layered approach for the implementation of the components. These layers ensures various features of the semantic web and retrieval of services.

To provide semantic mark up to web service a special language has to be used called DAML, which supports various actions performed in the semantically enabled domain like

- Web service discovery
- Web service invocation
- Web service composition
- Web service interpretation
- Web service execution and monitoring [21]

DAML-S supports 2 different types of web services namely atomic and composite. With DAML-S web services can be easily described and interpreted [22].

*B. Agents and behaviour*

Semantically enabled web service integration is depends upon the semantic description, characteristic and the behaviour of the agents. Agents dealt with the various attributes of the semantic environment such as dynamic, heterogeneous, single agent and multi agent systems. These agents must work with the back bone of the semantic environment that is ontology. Another important behaviour of the agents are to encapsulate the multiple services into single description. This will helps the service consumers to easily form the composite services [20].

*C. Web service selection for mobile devices*

There exists numerous web service selection models summarized in the Table 1 [23] suggested a selection model based on the user preferences and QOS. The inclusion of QOS attributes for the mobile web service selection depends upon the hardware and software and does not considers semantic description of the services or the specification for the request does not includes the semantic definition of the web services.

*D. Web service discovery in P2P networks*

The increase in volume of web services leads to severe drawbacks for the centralized repositories. The web services which are dynamic in nature and are not participated in the dynamic discovery process if they are reside in a traditional UDDI based registries [24]. The implementation of web services using P2P networks has the advantage of the peers such as memory space, processing capabilities and contents [25]. The communication between the nodes in a P2P network is achieved by the different algorithms described in [27]. But the P2P networks are having some similarities discussed in [26] such as

- Not well defined
- Supports only client server architecture features
- There is no fixed relation between the nodes
- Roles are concerned with individual nodes

TABLE 1  
Web service discovery model

S. No	Model Name	Based on
1	Centralized directory	Managed infrastructure [28]
2	Flooded request model	No infra structure / Pure P2P model [29]
3	Document routing model	Uses hash values for stored documents [30]

- Potation of P2P network concepts into mobile web service domain should dealt with many challenges
- Service publishing and discovery using any one of the P2P models
- Addressing mobile devices is difficult and requires Network Address Translation (NAT)
- Due to hardware limitation of the mobile devices providing server related functionalities is difficult
- Inconsistency in the QoS of the mobile computation environment

*E. Mobile Ontology*

Ontologies are very much useful in defining knowledgbase for the semantic information processing. It describes the concepts and relationships among the concepts for the domain of interest and captures the knowledge from it [33]. The development and maintenance of context aware mobile services is based on the quality of the ontology used in the mobile devices. Web services can be selected based on the following types of ontology such as user profile ontology, location ontology, delivery context ontology and domain ontology. It can be classified as shown in the figure 3

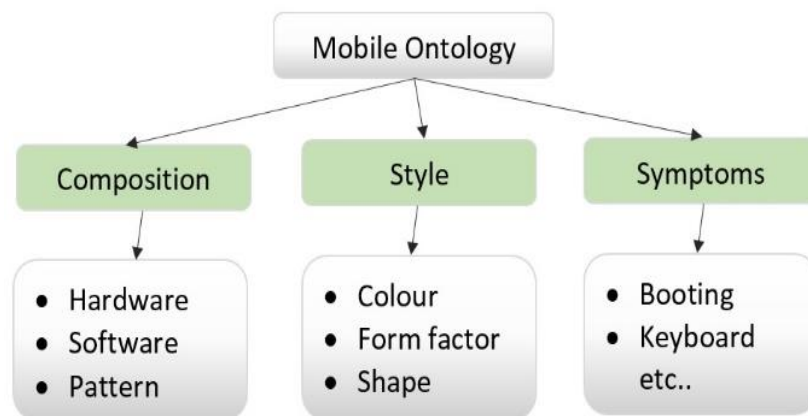


Fig. 3 Mobile Ontology attributes

### III-RESEARCH CHALLENGES

Mobile web services in a scalable environment leads to cause the so many research challenges. It includes the following:

- Developing web service for the distributed environment
- Developing and deploying web service discovery approach
- Locating the appropriate web services using syntactic or semantic approaches
- Classification and categorization of web services to improve the QoS

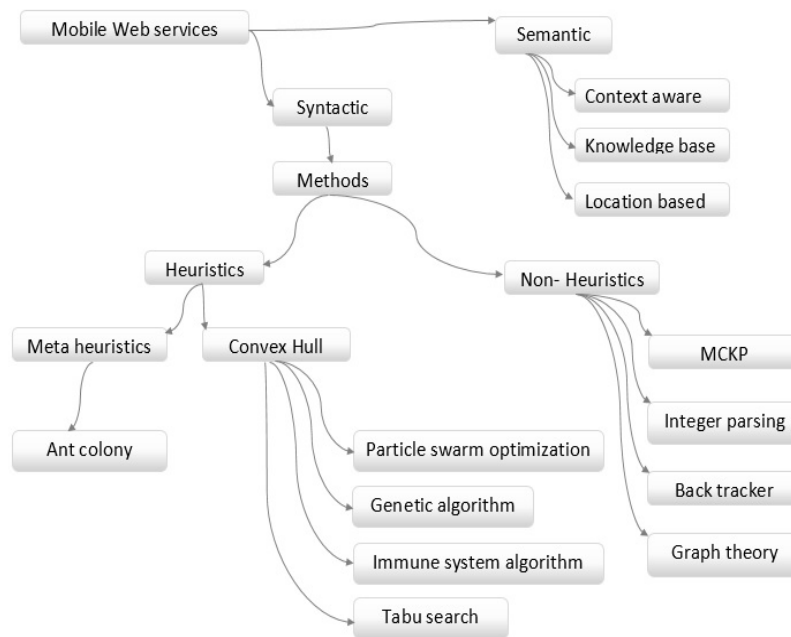


Fig 4 Mobile web services

There is an issue in the mobile web services when it becomes distributed mobile applications. The existing security patterns are validated through the model driven architecture using layered secured architecture discussed in [34]. Semantic web and service oriented architecture provides research direction to develop E-Health care applications like [35]

- Patient monitoring system
- Clinical path way
- Ontology based E-Health care
- Rule based Health care

The web service selection, invocation and composition processes are depends upon the various algorithms and methodologies which are depicted in the figure 4

### IV-CONCLUSION

This paper surveys the various approaches and methodologies used for web service selection, invocation and composition processes. The invigoration of semantic web services makes an impact in the mobile environment. The development in smart devices and technologies moving towards in adopting the semantic concepts and converts the existing syntactic environment into semantic environment. This conversion makes great changes in the mobile web service environment. This review well be helpful to choose appropriate methods to establish mobile web service environment with semantic features.

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